V. S. L. PATE

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ENTOMOLOGICAL NEWS

VOL. LI JUNE, 1940 No. 6

The Life History of the American Cockroach, Periplaneta americana Linn. (Orthop.: Blattidae).

By PHIL RAU, Kirkwood, Missouri.

(Continued from page 124.)

One often reads of the injury done to the eyebrows of sleeping children by this cockroach in Central and South America. The story, incredulous as it may seem, is that the roaches at night find the sleeping children and feed upon their eyebrows. From my own experience this seems quite probable, for on three occasions during the few years that I had had the roaches under observation they had absolutely no respect for my person when I fell asleep on the couch in the laboratory. On these occasions, I was awakened by a tickling sensation on my face, only to find upon opening my eyes, a pair of long cockroach antennae playing delicately for sense impressions while the cockroach's extended mouth parts were imbibing moist nutriment from my nostrils.

DAY AND NIGHT RHYTHMS.

Cockroaches of the household species, as everyone knows, are quiet by day and active at night. Temperature, light, and moisture, as well as sounds, are factors that influence their movements. Sometimes when one enters, during the daytime, a house that has been closed for a long time, one finds the roaches hurrying to cover; this indicates that the reversal of nocturnal behavior is due to quietude, rather than darkness. I have noted this behavior several times over a period of years with *B. orientalis,* and occasionally in reduced numbers with *P. americana.* On several occasions it was noted that temperature is the apparent factor to induce activity. As an example I may cite the following; on October 25, at 10 P. M., when the room temperature was 70 degrees F., about 300 orientalis

nymphs had left their hiding places and were active on floor, ceiling, and walls of their large container, but during the same time two days earlier when the temperature was 50 degrees F. only three had left their hiding places.

In contrast to cockroaches being active during day-light hours when the house is quiet, I have observed, time and time again, that when they are active at night in a darkened room, it takes not a great deal of light brought upon them suddenly to get them all to scamper to their hiding places. As an example, on November 7, the room temperature was 70 degrees F., at 7 P. M., I quietly entered the dark room, switched on the light, and the many roaches of *B. orientalis* and *P. americana* on wall, floor and ceiling of the cages at once scampered into their hiding places. When the light of a 40 watt shaded bulb was again turned off, they all crawled out of their dark holes within 5 or 10 minutes; when it was again turned on, they all went into hiding. This experiment was tried a dozen times before midnight and always with the same result. It shows that they are highly sensitive to differences in light intensities rather than to actual light, because if the latter were the case they would not come out during day-light as they often do when all is quiet, or remain uninfluenced when a dimmed flash light of low intensity is thrown upon them, as is described for the mating behavior in later pages.

The fact that both the Oriental and the American cockroach always come out of hiding at about dusk—and dusk may be anywhere from 5 to 8 P. M., according to season—shows quite plainly that their daily rhythms are influenced by conditions or intensities of light, rather than by an hereditary fixation which would induce activity each day when the hands of the clock, as it were, reached a certain point. One experiment which I neglected to perform, was to let the light burn for a week at a time, to see at what point hunger would cause them to reverse their nocturnal activity.

As the days and weeks go on, they become more and more accustomed to the use of artificial light by the observer and

when it is of low intensity they do not then run to cover so quickly, if they do so at all, as they did at first.

Mating Behavior.

When twilight falls *P. americana* come out of the crevices and scatter all over the big glass box in which the colony lives. If undisturbed by noise or light, they spend the entire night away from the home-crevices, but retire to them again before dawn. The night is the time when the entire cage is alive with big golden-yellow cockroaches doing any one of a number of things, feeding, toilet-making, preening the antennae, running about, climbing walls or ceilings, leaping from point to point,* indulging in courting antics, and in mating.

In the excitement of mating they tolerate the dim light of my flash lamp, and it is then possible to note some of the courtship and mating behavior. When the mating season is at its height, and a subdued light is flashed upon the colony, one's eye meets with an unusual spectacle. Dozens of excited males run hither and yon in a haphazard manner, with their long wings raised high in the air, their claspers spread wide open and their long abdomens, now stretched to nearly twice their length, dragging on the floor as they move. The whole population seems to be in motion—walking, running, hitting one another with their abdomens and with attempts at haphazard matings. I was able to observe a few details of the courtship and mating behavior, for example, at 9 P. M., on August 17, 1938, I found a male on the floor of the big container, fluttering his wings rapidly in front of a female two inches distant; she walks slowly away from him—he pursues her, and when she stops again he takes a position diagonally to one side of her and attempts to attach his claspers to the tip of her body. He does not succeed, however, because she has an egg-case protruding at the end of her abdomen which his claspers cannot grasp, and which apparently his sense organs, whichever ones they might be, failed previously to

* The cage is supplied with wooden uprights in the center and small boxes pyraminded at one end.

perceive. He runs away, but soon another male approaches, repeats the behavior and also for the same reason, fails to attach himself to her. Meanwhile another pair in copula on the wall nearby fall to the floor and separate; the female runs away but is pursued by two males; she finally escapes and hides under a piece of cardboard on the floor. About 18 males are wildly and excitedly running about the floor in many uncertain directions; their wings raised high in the air and the claspers widely extended. They pounce upon female after female, and occasionally a male with upright wings will push his own body under one of them, commencing at a point under her head and gradually working it backwards until the tips of both abdomens touch and then an exciting attempt is made to connect her body with his own. This is by no means easy to do and I have, in an hour, seen twenty failures to one successful mating. The females are mostly to blame for this because they are almost constantly on the move, and apparently they move about quickly because they do not wish the mating to occur. Sometimes however, the female is quiet, and the male with wings highly raised and genitalia spread open places the rear end of his own body under her head, pushes it quickly backwards until the tips of both abdomens touch and mating occurs at once.

Sometimes a male would make a dozen attempts at mating and miss his mark, and this was because he awkwardly attempted to reach his objective diagonally from one side or the other of the female, instead of from the front; and sometimes, even though he starts in the right way, he fails because he does not push his body back far enough. This is evidently due to the fact that he cannot possibly see what the tip of his abdomen is doing, although he actually does probe with it here and there among her segments.

I have made one observation in which the female took the initiative in the coutrship maneuvers. The male concerned, was one who unsuccessfully tried to mate with a female but

she ran off leaving him face to face with another lady only a few inches away. He approached her, and as he did so, she shook her body very violently from side to side for several seconds, as a man would do who was suffering with a chill. She repeated this antic seven or eight times, and when I thought it was about time for him to pay some attention to her, another male rapidly ran to her from the other side of the cage and quick as a flash, even before I had time to realize what was happening, he united the tip of his abdomen with hers and the pair was at once mated. When I realized what had happened I found the pair united with heads in opposite directions, the female slowly walking away and awkwardly dragging her male-burden after her, and finally disappearing with him under a bit of cardboard. I waited fifteen minutes, lifted the cardboard and found them still united; they separated upon being disturbed, but soon reunited when I replaced the cardboard.

Mating end-to-end with heads in opposite directions seems to be the normal procedure, but how they finally get into that position with the male making his approach from the front of the female is more than I can say. Walking slowly about while united in this fashion was observed for many pairs. I have also seen so many unsuccessful attempts at mating that I often blamed the awkwardness of the male; but I finally concluded that in many of the unsuccessful attempts the females were unwilling, or not at all ready to mate. In the few successful cases that I have observed early in the courtship, the females showed by their behavior a decided willingness to mate. The male cannot see to properly direct the genitalia in the mating procedure but I think that the cerci or stylets, in a sensory capacity, act as a probing organ, but no observations have been made to substantiate this statement.

The general impression is abroad that mating is quickly over with, but I have seen several pairs of Americana remain in copula for at least an hour and I think the time spent in this act is longer.

(To be continued.)

On a Collection of Centipeds from Texas, New Mexico and Arizona (Chilopoda).

By RALPH V. CHAMBERLIN and STANLEY MULAIK,
University of Utah, Salt Lake City.

(Continued from page 128.)

Llanobius santus new species.

A larger and darker species than the genotype. The body of the holotype is a dark, somewhat olivaceous brown, with the head, antennae, first segment and posterior end of dorsum orange; legs yellow. The dorsum is roughened with rugae much as in *paucispinus*.

Antennae short, attenuated, composed of 20 articles. Ocelli fewer than in *paucispinus*, numbering but 4 in the type, and these arranged thus: 2+2, the two upper ones larger than the two of the lower series.

Prosternal teeth very small, pale, 2+2, line of apices slightly recurved; median sinus nearly semicircular. Coxal pores very small, few, 2, 1, 1, 1.

The spining of the legs is as in *paucispinus*. From that species it differs, however, notably in having the claws of the anal and penult legs single instead of double.

Length, about 8 mm.

TEXAS: Tom Green County, 11 miles east of San Angelo. Male holotype taken 15 Dec., 1939.

TEXOBIUS new genus.

Resembling *Sigibius* but distinct in having the antennal articles fewer and definitely fixed at 19 in the genotype. Ocelli few. Prosternal teeth 2+2. None of the dorsal plates with posterior angles produced. Spines of legs reduced in number much as in *Sigibius*.

Unique in the form of the penult legs of the male in which the ultimate article is abruptly much thinner than the penult and also decidedly shorter than the ultimate article of the adjacent legs (13th and 15th); penult article with a lobe on caudal side of its distal end.

Claw of the gonopods of the female strictly entire; basal spines 2+2.

Genotype.—*Texobius unicus* new species.

Texobius unicus new species.

Body and legs pale yellow or lemon-colored, the head, or head and first segment or two, with antennae and prehensors darker, more or less orange-colored.

Head with lateral margins interrupted. Antennae short, articles 19 of which the last is somewhat longer than the two preceding taken together. Ocelli usually 5, in two series, 3, 2, those of lower series smallest, and the posterior eye of upper row not separated as "single" ocellus.

Prosternal teeth small and pale, 2+2, the line of their apices slightly recurved and the median sinus narrowly rounded at bottom. Coxal pores few, small, circular and uniseriate.

Ventral spines of first legs 0, 0, 0, 0, 0; of the second, 0, 0, 0, 0, 1. Ventral spines of the penult legs, 0, 1, 2, 1, 0; dorsal, 0, 0, 2, 0, 0; claw single. Ventral spines of anal legs, 0, 1, 1, 1, 0; dorsal, 0, 0, 2, 0, 0; claw single. None of the posterior coxae armed.

In the male the anal and penult legs are inflated, and much longer and thicker than the preceding ones; anal without special lobes; penult with last article much shorter than that of thirteenth or fifteenth legs, and abruptly much narrower than the penult article; distal border to penult article extended into a lobe or process on caudal side of base of last article, this bearing a patch of setae on caudal face.

Claw of gonopod of female strictly entire, acute; basal spines 2+2.

Length, about 6 mm.

TEXAS: Kerr County, Raven Ranch. About twelve specimens, most of which are males. Also one male taken 17 miles north of Alice, Brooks County, and three from a station south of Three Rivers, Live Oak County. All were taken in Dec., 1939.

Pholobius mundior new species.

When in full color the dorsum and the two posterior pairs of legs chestnut, with the dorsal plates often darker across caudal borders, the antennae chestnut or dark brown; legs other than the posterior pairs are yellow. Specimens not in full color vary from light brown to yellow.

Antennae rather short, composed mostly of from 30 to 35 articles of which those beyond middle are very short. Ocelli

in a subelliptic patch, black, with a single ocellus a little apart and moderately enlarged, the other ocelli small; arrangement, e. g., 1+4, 5, 5, 5, 3, 1.

Prosternal teeth commonly 5+5; the special marginal seta ectad and slightly caudad of outermost tooth on each side, the seta more robust than ordinary setae, slenderly subspiniform. Coxal pores round, uniseriate, a typical number and arrangement being 5, 5, 5, 5.

Ventral spines of anal legs, 0, 1, 3, 3, 1, or 0, 1, 3, 3, 2; dorsal, 1, 0, 3, 1, 0; claw single. Ventral spines of penult legs, 0, 1, 3, 3, 2; dorsal, 1, 0, 3, 1, 1; claw single. Last five pairs of coxae typically dorsally armed, the last two pairs laterally armed. Dorsal spines of first legs, 0, 0, 3, 2, 1; ventral, 0, 0, 2, 3, 2.

Posterior angles of ninth, eleventh, and thirteenth dorsal plates acutely produced, those of the seventh pair more broadly and moderately produced.

The gonopods of the female tripartite, with the acute median lobe much exceeding the laterals; basal spines 2+2, slender acuminate from base.

In the male the fourth joint of the anal legs is moderately crassate, flattened and slightly incurved from end to end above, with a shallow longitudinal dorsal furrow and a low rounded elevation at distal end. The last article of both anal and penult legs longitudinally furrowed on mesal (caudal) surface.

Length, 18 mm.

TEXAS: Kerr County, Raven Ranch. Many specimens taken in August and one in December, 1939.

Differs from *P. goffi* in lighter color, larger number of antennal articles, in having the ventral spines of penult legs 0, 1, 3, 3, 2 instead of 0, 1, 3, 3, 1, and the claw single instead of double, etc.

NEOLITHOBIUS SUPRENANS Chamberlin, Bull. Mus. Comp. Zool. Harvard College, 1925, vol. LVII, no. 8, p. 500.

TEXAS: Kerr County, Raven Ranch, many specimens; Bandera County, 7 miles north Medina; 11 miles southwest of Boerne. All the specimens were taken in December, 1939.

SCUTIGERIDAE.

SCUTIGERA COLEOPTRATA Linné. TEXAS: Kerr County, Raven Ranch. Several young and partly grown specimens taken in July, August and December, 1939.

Entomological Usage of Subspecific Names.[1]

By CURTIS W. SABROSKY, Michigan State College,
East Lansing, Mich.

An outline of the conflicting interpretations and problems of nomenclature regarding names of categories lower than species was presented by the writer in a recent issue of ENTOMOLOGICAL NEWS (Ent. News, L. pp. 197-203. July, 1939). It seems worthwhile at this time to place on record the data accumulated in a survey of the actual practices of entomological authors in North America during the past fifty years.

The present summary is based on all infra-specific names in entomology proposed as new during the fifty-year period, 1890 to 1939, inclusive, in the following North American journals[2]:

Academy of Natural Sciences of Philadelphia, Proceedings
American Entomological Society, Transactions
Biological Society of Washington, Proceedings
Brooklyn Entomological Society, Bulletin
California Academy of Sciences, Proceedings
Canadian Entomologist
Entomologica Americana (o. s.)
Entomological News
Entomological Society of America, Annals
Entomological Society of Washington, Proceedings
Insect Life
Insecutor Inscitiae Menstruus
Kansas Entomological Society, Journal
Microentomology
New York Entomological Society, Journal
Ohio Journal of Science and the Ohio Naturalist
Pan-Pacific Entomologist
Psyche
Smithsonian Miscellaneous Collections
United States National Museum, Bulletin
United States National Museum, Proceedings

[1] Journal Article No. 354 (n. s.) from the Michigan Agricultural Experiment Station.

[2] Complete to the end of 1939 except for the last three volumes of the Bulletin of the Brooklyn Entomological Society, and a few early issues of the Proceedings of the California Academy of Sciences. Approximately 750 volumes were examined during the survey.

It will be apparent to taxonomists that the above journals include a significantly large proportion of new infra-specific names in entomology, and that the general picture is therefore a fair representation of the practices of North American authors during the past half-century.

Table I. Total Number of New Infra-specific Names, 1890-1939, inclusive.

	Number	% of Total
Variety	1522	55.4%
Subspecies	746	27.1%
Race	90	3.3%
Aberration	151	5.5%
Form	110	4.0%
Transition Form	122	4.4%
Miscellaneous	6	.2%
Grand Total	2747	

Of the grand total (Table I) of 2,747 new infra-specific names which appeared during the period, over half (55.4%) were proposed as new variety, in spite of the fact that the word variety is not mentioned by the International Rules. "Variety" was therefore twice as frequently used as the term "subspecies", which accounted for one-quarter (27.1% of the new names. All other names together (race, form, etc.) accounted for the remainder. Variety and subspecies together totaled 82.5% or over four fifths of the names, indicating that the other terms are of much less frequent use and of relatively minor importance compared to the two principal categories.

Although the grand totals show a preponderance of usage in favor of variety, a shift or trend in the other direction is evident when the data are arranged by ten-year and five-year periods (Table II). The use of variety has decreased during the last few periods, whereas the use of subspecies has increased. The number of new subspecies exceeded the number of new varieties for the first time during the five-year period, 1935-1939, when 174 new subspecies were proposed, compared with 123 new varieties. The change is striking when one compares the latter period with the first ten-year period, 1890-

Table II. Total Number of New Varieties and Subspecies

(a) per Ten-year Periods

	1890-'99	1900-'09	1910-'19	1920-'29	1930-'39
Variety	104	266	443	428	281
Subspecies	6	69	210	193	268

(b) per Five-year Periods

	1925-1929	1930-1934	1935-1939
Variety	213	158	123
Subspecies	90	94	174

1899, in which new varieties outnumbered new subspecies 104 to 6. A part of the change is probably due to greater knowledge and discrimination, but undoubtedly there has been a considerable shift in ordinary practice among entomological workers in general.

As a further means of breaking down the data into more comparable classes, the various names were tabulated by order (Table III). The arrangement demonstrates that for the fifty-year period under consideration, the use of variety exceeded

Table III. The Use of New Infra-Specific Names, by Orders, 1890-1939, inclusive

	Variety	Subspecies	Race	Aberration	Form	Transition Form
Coleoptera	290	123	2	52	8	...
Lepidoptera	314	112	68	97	100	121
Hymenoptera	354	262	14	...	2	...
Diptera	122	77	2	...	2	...
Homoptera	269	19	2	...	...	...
Hemiptera	98	20	...	...	...	...
Orthoptera	28	74	3	...	2	...
Other Orders	45	38	...	...	...	...

that of subspecies in all cases but one, the Orthoptera (cf. Table VI). In some orders (e. g., Homoptera, 269 to 19) the difference is very great, probably due in the example cited to the extensive use of the term variety in the family Cicadellidae. In the order Hymenoptera, on the other hand, partly because of the frequent use of the term subspecies by specialists in the

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ants and bees, the totals for variety and subspecies are much closer. Over one-third of all new subspecies for the past fifty years were in Hymenoptera. Table III also shows the extremes in usage of infra-specific names, from the many terms employed in the Lepidoptera to the two kinds used in the Hemiptera and the smaller orders.

As a final step in the analysis, the data were arranged by ten-year periods for each order, to determine if there have been any noteworthy trends in usage in different orders. The orders Lepidoptera, Coleoptera, and Orthoptera are presented here as examples. The order Lepidoptera best illustrates the point that the data must be treated in several ways for full effect (Table IV). Although variety outnumbers subspecies 3 to 1 in the entire fifty-year period (cf. Table III), we find from Table IV that one-half of the varietal names in Lepidoptera were proposed *before 1910* (and two-thirds before 1915) but only 11 of all other names. After 1915, the use of variety dropped steadily, while the use of subspecies and of other terms increased remarkably. The use of names other than variety and subspecies reached its peak in the five-year period, 1925-1929, when such names were six times as numerous in the literature of Lepidoptera as the two major terms (199 to 36). Over half of all "new races" in entomology were proposed within this single five-year period in the order Lepidoptera alone.

Table IV. New Infra-Specific Names in Lepidoptera, per Ten-year Periods

	1890-'99	1900-'09	1910-'19	1920-'29	1930-'39
Variety	57	104	81	42	30
Subspecies	...	2	33	41	36
Race	1	1	3	48	15
Form	...	...	14	54	32
Aberration	4	3	15	66	9
Transition Form	...	...	...	77	44

The order Coleoptera further illustrates the corresponding increase of subspecies and decrease of variety in frequency of

use over the last twenty to thirty years (Table V). In the five-year period, 1935-1939, the number of new subspecies for the first time exceeded new varieties (33 to 12), the difference being great enough to show a predominance in favor of subspecies for the last ten-year period.

Table V. New Infra-Specific Names in Coleoptera, per Ten-year Periods

	1890-'99	1900-'09	1910-'19	1920-'29	1930-'39
Variety	3	60	96	85	46
Subspecies	1	21	10	28	63
Race	...	...	...	2	...
Form	...	...	...	7	1
Aberration	...	...	...	51	1

As the only order to show a greater number of subspecies than varieties in the grand totals, the order Orthoptera was also tabulated by ten-year periods (Table VI). The same trend is again evident, with variety decreasing and subspecies increasing in frequency. In the other orders, however, it has only been within the last ten years, and usually within the last five years, that subspecies have equaled in number or have slightly exceeded varieties (cf. Tables IV and V). In the Orthoptera, "subspecies" has definitely predominated since 1910, due in large measure to the lead of Rehn and Hebard. The change from variety to subspecies is much more marked than in any other order, for five-sevenths of the new varietal names were proposd *before* 1920, and three-fourths of the new subspecies were proposed *after* 1920.

Table VI. New Infra-Specific Names in Orthoptera, per Ten-year Periods

	1890-'99	1900-'09	1910-'19	1920-'29	1930-'39
Variety	4	14	2	5	3
Subspecies	...	5	13	20	36
Race	...	...	2	1	...
Form	1	1	...	...	...

The frequencies of variety and subspecies in the order Hymenoptera have not differed greatly since 1900, with variety

usually having a slight advantage in numbers. The other orders do not show striking differences.

CONCLUSION

The results of a survey of actual entomological practices in North America for the last fifty years (1890-1939, inclusive) on the use of variety, subspecies, race, etc., in proposing new infra-specific names, are briefly presented in tabular form.

Regardless of which viewpoint one upholds in discussions of principle, the fact is inescapable that over one-half of all new infra-specific names proposed in entomology in the last fifty years (at least in North America) were proposed as new varieties, and that nearly three-fourths were proposed under some categorical name other than subspecies.

Undoubtedly, some or many of the names proposed as new varieties were really names for subspecific entities and were so considered in the minds of the authors. The proposers of new varieties frequently discussed them as "geographic races", pointed out their distinctive range as opposed to related "varieties", etc., thus indicating beyond a doubt that they were dealing with "subspecies" in the geographic sense of the term. Such new "varieties" were at least proposed in the spirit of the Code, if not in the letter of the Code as interpreted by those who believe that only names proposed definitely as new "subspecies" are valid.

It is patently impracticable for the International Rules of Nomenclature to deal with auctorial concepts. Generally speaking, the Code must deal with the *names* as proposed, regardless of what the categories meant to the various authors. It would seem that an interpretation of the term subspecies in the Code should be guided in part at least by the practical applications and consequences resulting from the acceptance or rejection of terms for the several infra-specific categories. The present summary shows the extensive use of the term variety, far exceeding the use of subspecies, and the lesser use of other terms. The confusion which would result from the absolute rejection of all such names as invalid is worthy of careful consideration.

Spring Collecting in the far South and the Big Freeze of 1940. (Lepidoptera).

By MARGARET M. CARY, Philadelphia, Pennsylvania.

From the 22nd of March to the 12th of April, 1940, John W. Cadbury, III, and I have been engaged in making an entomological Survey in the far South for the Academy of Natural Sciences. The first two weeks were spent in collecting in the Okefenokee Swamp of Southern Georgia and part of the third week was spent in extreme southern Florida in Everglades and Florida City. We selected these weeks because normally in our experience they are among the best of the year for collecting.

In the Swamp we used a gasoline pressure lamp hung in front of a white sheet and every evening sugared about one hundred trees. We not only got very few species but very few specimens of any species. It was warm, day temperatures reaching as high as 98 degrees, the rain conditions normal, there was little wind. On several nights the collecting conditions seemed ideal. We began to wonder whether the extreme cold of February had something to do with this shortage, finding that for two nights the temperatures had dropped as low as 18 degrees with cold days preceding and following the actual freeze. In the daytime a few butterflies of common species were seen, but this type of piney woods has few flowers, and there are never many butterflies.

We then went to Everglades where a few years before at this time of year both the Noctuid and Sphingid collecting had been outstandingly good. We had for instance in four nights of collecting over petunias secured 45 fresh and perfect specimens of the scarce Sphingid, *Madoryx pseudothyreus*. The Academy owns the type of this species and we had hoped to collect a series of fresh specimens here. We found an almost ideal garden of petunias and many other sweet-smelling flowers, received permission to collect there, and went to work with high hopes. Not a single Noctuid or Sphingid came to those flowers that evening. There was not even a single *Proto-*

parce celeus or *carolina* which before had been in droves. The lights, although well placed, also produced nothing.

In Florida City we collected over petunias in the early evening, catching one *Dolba hylaeus,* and about eleven o'clock, armed with headlights, we collected over the sweet-smelling night-blooming jasmine bushes, whose heavy odor fills the air for hundreds of yards. In other years these bushes swarm with Noctuids, Notodonts, Sphingids, so that one has to select his species. This year, although the night was warm and still, we secured two Notodonts, three Noctuids and one common Sphingid, *Xylophanes tersa.* The lights of the town and the sugar yielded nothing. In Florida City the temperature had reached 24 on two successive nights and many tropical plants and palms were brown and dead. The freezing damage was even more apparent at Everglades where the temperature was equally low. All the mangrove islands of the Ten Thousand Islands, as far as eye could see, were completely brown and dead to the water line where new shiny green sprouts were coming out. While all collectors have experienced many disappointments for various reasons it seems fairly clear to us that the great freeze of 1940 has laid an unusually heavy toll on Insect life. Resident collectors are waiting to see what happens the rest of the season, but are inclined to agree with us as to the cause of this year's poor collecting.

Fernald Club Yearbook for 1939.

This Yearbook is the ninth annual report of the Fernald Entomological Club, Massachusetts State College, Amherst. It is devoted to the personnel, present and past, and the interests of the Department of Entomology. This issue is dedicated to the late Dr. W. E. Britton, state entomologist of Connecticut, to whom Prof. A. I. Bourne pays a tribute, while Dr. E. P. Felt contributes a biographical notice. A portrait of Dr. Britton accompanies it. There is a biography of Dr. Harvey L. Sweetman, author of the recent volume on Biological Control of Insects, Assistant Professor at the College. Interesting data are given on the discovery of arsenate of lead, as an insecticide, by the late Prof. Charles H. Fernald and associates. Many notes on the recent activities of the Department fill the rest of the 36 mimeographed pages.

A new Species of Encopognathus from California (Hymenoptera, Sphecoidea).

By P. H. Timberlake, University of California, Citrus Experiment Station, Riverside, California.

Rhectognathus was described by Pate (Entom. News, 47, p. 147, 1936) as a subgenus of *Encopognathus*, but it is perhaps a good genus. The angulation of the intercubitus in *Encopognathus* and *Rhectognathus* was stressed by Pate, but possibly the significance of this structure escaped his attention. When the fore wing of *Rhectognathus* is viewed by transmitted light, the obsolete portion of the venation is visible as fine creases. These creases indicate the ancestral form of venation, viz., a petiolate second cubital cell, which has become obsolete by the atrophy of the outer fork of the intercubitus and corresponding part of the cubitus. The second recurrent is also indicated by a crease and is interstitial with the outer fork of the intercubitus. In various other Crabronines there is no such indication of a petiolate second cubital cell, although the venation is otherwise similar. *Rhectognathus*, therefore, may show some remote affinity with *Bothynostethus* (usually classified with the Larrinae), which has a similarly shaped head and prepectus (Crabronine characteristics), but on the other hand, has three cubital cells, the second petiolate, a short, pointed marginal cell, and simple mandibles. The head in *Rhectognathus* is shaped much as in *Entomognathus*, but is somewhat less quadrate, with the temples and vertex less lengthened behind the eyes and the eyes are slightly less convergent below.

Encopognathus (Rhectognathus) rufiventris n. sp.

Similar to *E. (R) pectinatus* Pate, but is distinguished by the red color of the abdomen, a different denticulation at apex of clypeus, more dusky wings, with fuscous veins, and somewhat duller, more aciculate sculpture.

♀.—Head and thorax black. Scape, tubercles, spot at anterior end of tegulae, transverse line on each side of thorax between scutellum and wing base, metanotum medially and thin line on posterior margin each side to base of hind wings, apex of all femora, tibiae except on inner side, front tarsi and base of middle and hind tarsi, yellowish-white. Under side

of flagellum narrowly pale brownish beneath, this color gradually changing to yellowish-white on the basal segments and on under side of pedicel. Mandibles rufo-piceous at base, red in middle and black at apex. Tegulae testaceous, except the white spot. Spurs pallid. Abdomen red, with the basal half of tergite 1 and a rather large but nubilous mark on middle of basal part of tergites 2 to 4, black. (In *pectinatus* the abdomen is black, with the apex yellowish-white). Venter, except last segment, blackish, the apical border of ventrites 2 to 5 broadly testaceous, with a golden luster. Wings lightly infuscated, the veins nearly black.

Apical margin of clypeus with six teeth (seven in *pectinatus*), the inner pair and outermost ones rather broad and blunt, the other two subacute. Head and thorax duller than in *pectinatus*. Frons, vertex and mesonotum minutely aciculate, with fine punctures. The punctures slightly coarser than in *pectinatus* and considerably sparser, especially on the head and mesoscutum. Cheeks duller, finely, closely and longitudinally carinate anteriorly, with minute punctures between the lines. Anterior half, or a little more, of mesopleura sculptured like mesoscutum, the posterior margin and metapleura polished. Sculpture of propodeum nearly as in *pectinatus*, but duller. Abdomen about the same in shape and sculpture as in *pectinatus*. Pubescence and ammochaetae practically the same in the two species, with the clypeus, except median beveled area, and lower half of anterior orbits densely silvery.

Length, 5 mm.; anterior wing, 4 mm.; width of head, about 1.7 mm.

One female (*holotype*) collected at flowers of *Phacelia distans*, 10 miles southwest of Victorville, CALIFORNIA, May 6, 1939 (Timberlake). Type in collection of Citrus Experiment Station, Riverside, California.

E. pectinatus is represented in the collection by one female, taken at flowers of *Baeria chrysostoma*, near Strathmore, Tulare County, California, March 29, 1937.

Invasion from Africa (Diptera: Culicidae).

Under this title, the Review for 1939 of the Rockefeller Foundation by its President, Raymond B. Fosdick, devotes six pages to an account of the campaign, in north-eastern Brazil, against the African malaria-carrying, *Anopheles gambiae*. First found at Natal, Brazil, in 1930, this mosquito, following the prevailing winds, now occupies 12,000 square miles.

Two New Species of Batrisodes from South Carolina (Coleoptera: Pselaphidae).

By MILTON W. SANDERSON, University of Arkansas, Fayetteville, Arkansas.

The two new species described in this paper were among a box of miscellaneous Pselaphidae recently sent me for determination by O. L. Cartwright, Clemson College, South Carolina. Although each species is represented by a single male, they are believed to be sufficiently distinct from all described species in this difficult genus to warrant their descriptions. Both species were collected by Mr. Cartwright, one is named in his honor, and through his courtesy I have been allowed to retain the types in my collection.

Batrisodes cartwrighti n. sp.

Length 2.25 mm.; width .78 mm.

Color dark brown, elytra lighter and more reddish, appendages paler. Upper surface, except head, impunctate, clothed with short, yellow, subdecumbent hairs.

Head slightly wider across eyes than from base to anterior margin of clypeus; quadrate. Vertex elevated, convex, and without carinae; less closely and coarsely punctured than remainder of head. Front continuous with clypeus, not excavated between antennae, declivous in front of antennal bases at an angle of about 45 degrees. Sides emarginate next the antennae; front strongly and closely punctured. Clypeus less strongly punctured and more shining. Circumambient sulcus obsolete anteriorly, each sulcus terminating in a slight depression. Frontal foveae small, nude, and on a line through the hind margin of the eyes. Sides of head in front of the semicircular and finely faceted eyes straight, but strongly convergent and rounded posteriorly to the neck. Side of head behind eye nearly twice diameter of eye.

Antenna shorter by the distal segment than the combined length of pronotum and elytra in the median line. First segment longer and broader than either of the next eight, distinctly punctured anteriorly on lower surface; third slightly longer than wide, the following six with length and width subequal; tenth abruptly larger than ninth, nearly circular, and with a large internal fovea occupying nearly an entire side of segment; eleventh slightly narrower than tenth, narrowed in anterior two-thirds, as long as preceding two combined. All segments with long, yellow hairs.

Pronotum as wide as long, wider slightly before the middle. Median sulcus distinct in front of basal fovea to within a distance equal to length of first antennal segment behind apex. A small carina from fovea to base. Extreme base of pronotum with two foveae on each side near hind angles; lateral discal foveae distinct. Discal carina, before the spiniform process, distinct and ending opposite end of median sulcus.

Lower side of front femur angulate at basal one-third. Inner margin of middle tibia at apex with a short oblique spine. Hind tibia with a terminal spur equal to width of tibia at apex.

Elytra wider than long, sides evenly rounded; humeri very distinct and acutely spinose. Three distinct basal foveae on each elytron.

Abdomen equal in length to elytra, the abdominal carinae extremely basal and occupying about one-fifth of width of segment. Pygidium very strongly tumid in middle, transverse. Last ventral segment deeply and broadly, longitudinally excavated, the excavation opening posteriorly, and with the produced though transversely narrowed fifth segment visible above the excavation.

Holotype male, Clemson College, SOUTH CAROLINA, April 13, 1931, O. L. Cartwright.

The absence of the inner antennal excavation places this species in Bowman's Group II (The Pselaphidae of North America, 1934, p. 59). The only eastern species in this group is *schaumi* Aube, from which *cartwrighti* differs by its impunctate elytra and absence of a tooth on seventh and eleventh antennal segments of male. It differs too from all other species in this group by its sexually modified antennae. The tenth segment is as broad as the eleventh, and has a large fovea on the inside.

Batrisodes curvatus n. sp.

Length 2.1 mm.; width .68 mm.

Color reddish brown, the elytra and appendages lighter. Upper surface impunctate, rather thickly clothed with yellow, subdecumbent hairs nearly equal to width of first antennal segment.

Head from base to apex of labrum approximately equal to width across eyes. Vertex elevated, convex, and with one carina in median line at base. Front declivous, narrowed between the antennae and continuous to the margin in the form of a slight carina. Circumambient sulcus distinct though

somewhat evanescent anteriorly at the smooth and excavated front between antennae. Frontal foveae small, mutually separated by a distance subequal to the distance from fovea to eye, the foveae on a line behind the hind margins of the eyes. Tempora behind eyes rounded, convergent, and twice the length of the eye; hind angles of head not distinct. Eyes small, convex.

Antenna about equal to combined length of pronotum and elytra. First segment broader though shorter than the next two combined; two to seven subequal in length, a little longer than wide; eight as wide as seven, nearly circular; ninth and tenth increasing in width and strongly rounded; eleventh still broader and longer than ninth and tenth combined. All segments clothed with long yellow hairs.

Pronotal length and width subequal, the greatest width slightly in advance of middle. Median sulcus only faintly evident in apical third; basal fovea distinct. A small carina from fovea to base. Extreme base of pronotum with two foveae on each side near hind angles; lateral pubescent foveae on a line slightly in advance of median basal fovea. Discal carina indicated only by a short, obtuse projection, slightly carinate anteriorly, between lateral and median foveae.

Hind femur nearly parallel-sided in basal two-fifths, then rather strongly clavate and spindle shaped to apex. Trochanter of hind leg with a short basally recurved spine at its apex. Hind tibia with spurs.

Elytra slightly wider than the sutural length, sides rather evenly rounded, the humeri just visibly distinct, not at all toothed. Base of elytron apparently with three foveae, the sutural one very small and close to the second. Discal stria obsolete.

Abdomen very slightly narrower than elytra. Basal abdominal carinae very short and occupying one-fifth of abdominal segment at base; extreme base of segment transversely grooved and pubescent. Last ventral segment slightly depressed in basal two thirds, the apex somewhat lobed to fit the rounded pygidial emargination.

Holotype male, Clemson College, SOUTH CAROLINA, April 25, 1938, O. L. Cartwright.

This species appears to occupy an intermediate position between *cavicrus* Csy. and *carolinae* Csy. While agreeing with both species in the dentiform trochanter, it differs from *cavicrus* by the single carina on the head, pronotum without a distinct median groove, except a slight one anteriorly, and the two series of recurved pronotal spines are absent. It agrees

with *carolinae* by the unicarinate occiput, but differs notably by its impunctate hind femora, and lack of recurved pronotal spines.

An Undescribed Corythucha (Tingitidae-Hemip.) from Colorado.

By C. J. DRAKE, Iowa State College, Ames, Iowa.

The new species of lace bug described below was collected, by sweeping vegetation, in Colorado. The types are in the collection of the author.

Corythucha tuthilli sp. nov.

Small, whitish, without color marking. Antennae rather short, brownish, beset with a few long, bristley hairs, the fourth segment dark at apex. Body beneath, including bucculae, head and rostral laminae black. Rostrum long, extending almost to end of sulcus. Legs slender, brownish, the tibiae testaceous.

Pronotum almost flat, whitish, slightly grayish in front, distinctly pitted; triangular process long, sharply narrowed posteriorly, reticulate; lateral carinae strongly foliaceous, areolate, arched above, concave within, extending forward to the base of hood; median carina not strongly arched above, about one-third as high as hood, the areolae large, rectangular, some of them divided so as to be two deep in highest part. Hood moderately large, longer than median carina, narrowed anteriorly, extending in front of head, moderately constricted near the basal third. Paranota long, broad, mostly four areolae deep. Elytra distinctly narrowed posteriorly, widest near base, the tumid elevation moderately large; costal area moderately broad, biseriate. Margins of elytra, paranota and carinae armed with moderately long, black-tipped spines; also nervelets of hood, paranota and elytra with erect spines.

Length, 3.45 mm.; width, 1.45 mm.

Holotype (male), *allotype* (female) and 8 *paratypes* Creede, COLORADO, July 14, 1938, collected by L. D. Tuthill.

This species is distinctly smaller than other western species of similar color. The long lateral carinae, shorter spines and biseriate costal area separate it from *C. hispida* Uhler. *C. immaculata* O. and D. is a much larger species with triseriate costal area.

List of Titles of Publications Referred to by Numbers in Entomological Literature in Entomological News.

1. Transactions of The American Entomological Society. Philadelphia.
2. Entomologische Blätter, red. v. H. Eckstein etc. Berlin.
3. Annales Sci. Naturelles, Zoologie, Paris.
4. Canadian Entomologist. London, Canada.
5. Psyche, A Journal of Entomology. Boston, Mass.
6. Journal of the New York Entomological Society. New York.
7. Annals of the Entomological Society of America. Columbus, Ohio.
8. Entomologists' Monthly Magazine. London.
9. The Entomologist. London.
10. Proceedings of the Ent. Soc. of Washington. Washington, D. C.
11. Deutsche entomologische Zeitschrift. Berlin.
12. Journal of Economic Entomology, Geneva, N. Y.
13. Journal of Entomology and Zoology. Claremont, Cal.
14. Archivos do Instituto Biologico, Sao Paulo.
15. Annales Academia Brasileira de Sciencias. Rio de Janeiro.
17. Entomologische Rundschau. Stuttgart, Germany.
18. Entomologische Zeitschrift. Frankfurt-M.
19. Bulletin of the Brooklyn Entomological Society. Brooklyn, N. Y.
20. Societas entomologica. Stuttgart, Germany.
21. The Entomologists' Record and Journal of Variation. London.
22. Bulletin of Entomological Research. London.
23. Bollettino del Lab. di Zool. gen. e agraria della Portici. Italy.
24. Annales de la société entomologique de France. Paris.
25. Bulletin de la société entomologique de France. Paris.
27. Bolletino della Societa Entomologica Italiana. Genova.
28. Ent. Tidskrift utgifen af Ent. Föreningen i Stockholm. Sweden.
29. Annual Report of the Ent. Society of Ontario. Toronto, Canada.
30. Archivos do Instituto de Biologia Vegetal. R. d. Janeiro.
31. Nature. London.
32. Boletim do Museu Nacional do Rio de Janiero. Brazil.
33. Bull. et Annales de la Société entomologique de Belgique. Bruxelles
34. Zoologischer Anzeiger, hrsg. v. E. Korschelt. Leipzig.
35. The Annals of Applied Biology. Cambridge, England.
36. Trans. Royal Entomological Society, London. England.
37. Proceedings of the Hawaiian Entomological Society. Honolulu.
38. Bull. of the Southern California Academy of Sciences. Los Angeles.
39. The Florida Entomologist. Gainesville, Fla.
40. American Museum Novitates. New York.
41. Mitteilungen der schweiz. ent. Gesellschaft. Schaffhausen, Switzerland.
42. The Journal of Experimental Zoology. Philadelphia.
43. Ohio Journal of Sciences. Columbus, Ohio.
44. Revista chileña de historia natural. Valparaiso, Chile.
45. Zeitschrift für wissenschaftliche Insektenbiologie. Berlin.
46. Zeitschrift für Morphologie und Ökologie der Tiere. Berlin.
47. Journal of Agricultural Research. Washington, D. C.
49. Entomologische Mitteilungen. Berlin.
50. Proceedings of the U. S. National Museum. Washington, D. C.
51. Notulae entomologicae, ed. Soc. ent. Helsingfors. Helsingfors, Finland.
52. Archiv für Naturgeschichte, hrsg. v. E. Strand. Berlin.
53. Quarterly Journal of Microscopical Science. London.
54. Annales de Parasitologie Humaine et Compareé. Paris.
55. Pan-Pacific Entomologist. San Francisco, Cal.

56. "Konowia". Zeit. für systematische Insektenkunde. Wien, Austria.
57. La Feuille des Naturalistes. Paris.
58. Entomologische Berichten. Nederlandsche ent. Ver. Amsterdam.
59. Encyclopédie entomologique, ed. P. Lechevalier. Paris.
60. Stettiner entomologische Zeitung. Stettin, Germany.
61. Proceedings of the California Academy of Sciences. San Francisco.
62. Bulletin of the American Museum of Natural History. New York.
63. Deutsche entomologische Zeitschrift "Iris". Dresden.
64. Zeitschrift des österr. entomologen-Vereines. Wien.
65. Zeitschrift für angewandte Entomologie, hrsg. K. Escherich. Berlin.
66. Report of the Proceedings of the Entomological Meeting. Pusa, India.
67. University of California Publications, Entomology. Berkeley, Cal.
68. Science. New York.
69. Physis. Revista Soc. Argentina Cien. Nat. Buenos Aires.
70. Entomologica Americana, Brooklyn Entomological Society. Brooklyn.
71. Novitates Zoologicae. Tring, England.
72. Revue russe d'Entomologie. Leningrad, USSR.
73. Mem. Instituto Butantan. Sao Paulo, Brazil.
74. Sbornik entomolog. národniho musea v Praze. Prague, Czechoslovakia.
75. Annals and Magazine of Natural History. London.
77. Comptes rendus heb. des séances et mémo. de la soc. de biologie. Paris.
78. Bulletin Biologique de la France et de la Belgique. Paris.
79. Koleopterologische Rundschau. Wien.
80. Lepidopterologische Rundschau, hrsg. Adolf Hoffmann. Wien.
82. Bulletin, Division of the Natural History Survey. Urbana, Illinois.
83. Arkiv för zoologie, K. Svenska Vetenskapsakademien i. Stockholm.
84. Ecology. Brooklyn.
85. Genetics. Princeton, New Jersey.
87. Archiv für Entwicklungs mechanik der Organ., hrsg. v. Roux. Leipzig.
88. Die Naturwissenschaften, hrsg. A. Berliner. Berlin.
89. Zoologische Jahrbücher, hrsg. v. Spengel. Jena, Germany.
90. The American Naturalist. Garrison-on-Hudson, New York.
91. Journal of the Washington Academy of Sciences. Washington, D. C.
92. Biological Bulletin. Wood's Hole, Massachusetts.
93. Proceedings of the Zoological Society of London. England.
94. Zeitschrift für wissenschaftliche Zoologie. Leipzig.
95. Proceedings of the Biological Soc. of Washington, Washington, D. C.
97. Biologisches Zentralblatt. Leipzig.
98. Le Naturaliste Canadien. Cap Rouge, Chicoutimi, Quebec.
99. Mélanges exotico-entomologiques, Par Maurice Pic. Moulins, France.
100. Bulletin Intern., Acad. Polonaise Sci. et Lett. Cracovie.
101. Tijdschrift voor entomologie. Nederland. Ent. Ver., Amsterdam.
102. Entomologiske Meddelelser, Entomologisk Forening, Copenhagen.
103. Journal of the Kansas Entomological Society, Lawrence, Kansas.
104. Revista de la Sociedad entomologica Argentina, Buenos Aires.
105. Revista de Entomologia, Rio de Janeiro, Brazil.
106. Anales Sociedad Cientifica Argentina, Buenos Aires.
107. Proc., Royal Entomological Society, London.
108. Revista, Col. Nac. Vicente Rocafuerte, Guayaquil.
109. Arbeiten uber morpholog. und taxonom. ent. aus Berlin-Dahlem.
110. Arbeiten ueber physiolog. u. angewandte ent. aus Berlin-Dahlem.
111. Memorias do Instituto Oswaldo Cruz. Rio de Janeiro.
112. Anales del Instituto de Biologia Mexico.
113. Entomologische Beihefte aus Berlin Dahlem.
114. Occasional Papers of the Museum of Zoology, University of Michigan.
115. Memorias de la Soc. Cubana de Hist. Nat. Havana, Cuba.
116. Parasitology. Ed. Keilin and Hindle. London.

Current Entomological Literature

COMPILED BY V. S. L. PATE, L. S. MACKEY and E. G. FISHER.

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the current or preceding year unless otherwise noted. All continued papers, with few exceptions, are recorded only at their first installment.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of Entomological News for 10c. The number of, or annual volume, and in some cases the part, heft, &c., the latter within ( )follows; then the pagination follows the colon :

Papers published in the Entomological News are not listed.

GENERAL.—Balduf, W. V.—The bionomics of entophagous insects. Part II. 384 pp., ill. John S. Swift Co., Inc. **Brues, C. T.**—Is ours the "Age of Insects?" [Scien. Monthly] 1940: 413-418. **Cutright, P. R.**—The Great Naturalists explore South America. 1940: 284-323. Published by The MacMillan Company. New York. **Frenguelli, J.**—Nidos fósiles de insectos en el terciario del Neuquén y Río Negro. [Notas del Museo, Buenos Aires] 4: 379-402, ill. **Ide, F. P.**—(See under Smaller Orders of Insects.) **Kautz, H.**—Meine Stellungnahme zur Frage der Anpassung an die Umgebung auf Grund eigener Beobachtungen. [64] 25: 49-55, ill. **Rensch, B.**—Tiergeographie. [Fortsch. der Zool.] 4: 307-328. **Thiel, M. E.**—Systemlehre und Stammesgeschichte. [Fortsch. der Zool.] 4: 222-286, ill. **Tonnoir, A. L.**—Obituary by A. J. Nicholson. [31] 145: 453-454.

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SPECIAL NOTICES.—Generic Names of British Insects. Part 7. Pub. by Roy. Ent. Soc. London. 1940. 196-209, **Hautflugler oder Hymenoptera.** 1: Ameisen oder Formicidae. By H. Stitz. [Tierwelt Deutschlands] 37: 428 pp., ill.

Destructive and Useful Insects; their Habits and Control. By C. L. Metcalf and W. P. Flint. Edition 2. McGraw-Hill Book Company. $7.50. In 1928 these authors put out a book under this title which I considered one of the most important on the subject published in America and which both the teacher and layman should find to be one of the most valuable books on insects and their relation to man. It presents most concisely our knowledge of insects in their various phases: their importance to man as regards injurious and beneficial rôles; their general classification; and their control. That first edition contained 918 pages and over 561 figures. In 1939 this second edition appeared, containing 981 pages and 584 figures and was found necessary because of the astonishing progress made in the knowledge of the life histories, bionomics, morphology and physiology of our most important insect species. Of the 918 pages in the first edition, only a few remain unchanged in the present one. Much effort has been made to present the context in such manner that it may be readily understood by even the most uninitiated; and for those seriously interested in the species concerned, determination keys to their orders, are presented, augmented by illustrations of the types of insects of these various orders. A most interesting and useful compendium of economic entomology.

E. T. Cresson, Jr.

THE SPIDER BOOK. By JOHN HENRY COMSTOCK. Revised and edited by Dr. W. J. GERTSCH. Doubleday, Doran & Company, Inc. 729 pages, over 770 illustrations. 1940. $6.00.—The exhaustion of the first edition of this work by America's beloved teacher of entomology, which appeared in 1912, indicated the increased interest his book created in this universally shunned and feared group of animals. No American work, since Dr. Henry C. McCook's volumes on American spiders, has in any way presented the spider as interestingly as Comstock's book. The publishers of Comstock's book have persuaded Dr. W. J. Gertsch, of the American Museum of Natural History, an authority in this field, to go over the original work for this new edition. However, he has found it unnecessary to make many changes, and those made were merely to bring it into line with the more modern systems of classification and are chiefly in the taxonomic sections, with the introduction of new keys and revisions by others. This book should be in the library of all students of nature and will be indispensable to those serious students of spiders.

E. T. CRESSON, JR.

COMPENDIUM OF ENTOMOLOGICAL METHODS. PART I COLLECTING MAYFLIES (EPHEMEROPTERA). By JAY R. TRAVER, Ph.D., Massachusetts State College, 1940. Ward's Natural Science Establishment, Inc., Rochester, New York. 8 unnumbered pages, 17 unnumbered figures.—We are informed that this publication will contain specific information concerning the various orders and groups of insects written by specialists. It is designed to give detailed directions concerning methods of collecting and preparing specimens for study. The various sections will be mailed free of charge to all professional and amateur entomologists requesting them from the publisher. Part I gives instructions for collecting and preserving both immature and winged stages of mayflies and for rearing life history material, by one of the joint authors of *The Biology of Mayflies* of 1935. Parts on Orthoptera, by Dr. Irving J. Cantrall, and on Mallophaga, by Dr. F. H. Wilson, are promised. It is hoped, when the series is complete, that the resulting Compendium may be published in book form. The plan of this series is commendable. Wards announce also the early publication of a new booklet entitled *How to Collect,, Mount and Store Insects,* profusely illustrated.—P. P. CALVERT.

STUDIES IN THE MECOPTERA. Reprinted from The American Midland Naturalist, Vol. 23, No. 2, pp. 257-367, March, 1940. For sale by the Naturalist at University of Notre Dame, Notre Dame, Indiana, price $1.00, paper bound, postpaid.—This reprint consists of two articles: Biology and morphology of some North American Bittacidae by L. R. Setty, of Park College, Parkville, Missouri. (pp. 257-353, 179 figs), and The genital anatomy and mating behavior of *Borcus brumalis* by Kenneth W. Cooper, of the Dep't. of Biology, Princeton University (pp. 354-367, 9 figs.). Both are accompanied by extended bibliographies.

Mr. Setty's article is preceded by an extensive table of contents which makes it easy to find any topic in which the reader may be interested. While much of this study was made at Cornell University, his field observations extended through a number of the United States. The biology and morphology of egg, adult and larva of various species of *Bittacus* are described, both external and internal structure being included. There is a section on the importance of these hanging flies (which "deserve to be placed on the list of insects beneficial to man" because of the adults feeding on mosquitoes and of the scavengering habits of the larvae) and another on improved methods and apparatus for biological work. This is an important paper for the subjects of which it treats and for comparative insect morphology and life history.

The title of Dr. Cooper's article describes its contents. He has found differences in both male and female internal reproductive organs of *B. brumalis* Fitch from those of *B. hyemalis* L. In spite of these "marked internal differences, the mating, behavior of *brumalis*, is identical with that of *hyemalis*. Correspondingly, the external genitalia, are remarkably similar." Cooper's observations on mating agree with those of Brauer (1855), Poujade (1884), Cockle (1908), Withycombe (1926) and Steiner (1937) but contradict those of Carpenter (1936).

—P. P. CALVERT.

THE CHEMISTRY AND TOXICOLOGY OF INSECTICIDES. By HAROLD H. SHEPARD, Ph.D., Assistant Professor of Entomology and Economic Zoology, University of Minnesota, Burgess Publishing Co., 426 South 6th St., Minneapolis, Minnesota. 1939. 10¾ x 8½ inches, (7) + 383 pages, mimeoprinted on both sides of each leaf, 97 tables, 40 figs. $4.00.—The author says in his foreword: "This volume is intended not only for

college students of entomology who will use it as a class-room text, but for the many persons in public and private entomological pursuits who need a reference book on this subject. It is the purpose of the author to present within the limits of a book of convenient size the important facts and theories relative to insecticides, including not only the chemical, physical and toxicological aspects, but also information regarding the history and commerce pertaining to this field. Although this text is not merely an annotated bibliography, it is primarily a guide to the insecticide literature. Methods of insect control are not given except as the action of specific insecticides is illustrated. Spray schedules often are of only local significance." The first four chapters, 46 pages, comprise an Introduction, History of Insecticides, Principles of Insecticide Toxicology and Quantitative Toxicology of Insecticides. The introduction (pp. 3-4) presents "a convenient classification of insecticides" which is followed in the later chapters. It is:

Stomach Poisons: Arsenicals (chap. 5), Fluorine and other inorganic poisons (chap. 6).

Contact Poisons (*Inorganic*) Sulfur, copper and selenium compounds (chap. 7).

Contact Poisons (*Organic*) Mineral, vegetable and animal oils and soaps (chap. 8).

Plant Products: Nicotine, pyrethrins, rotenone, hellebore and others (chap. 9).

Fumigants: Hydrocyanic acid, sulfur dioxide, carbon disulfide, chlorinated hydrocarbons, methyl bromide and crystalline compounds (chap. 10).

Miscellaneous Chemical Control (chap. 11).

Each chapter ends with a list of references. An appendix contains conversion tables. An alphabetical index occupies a little more than six pages. As a sample of the treatment of the subject matter, chapter 5 on arsenical totals 63 pages, of which 3 are devoted to the estimation of the toxicity of stomach poisons to insects, 14 to the chemistry of the arsenicals, 1 to the determination of arsenic, 5 to the solubility of arsenicals, 3+ to spray mixtures and correctives, 3 to effect of arsenic on plants, 3 to spray deposit and its ingestion by insects, 7 to the toxicology of arsenic in insects, 1 to relative toxicity to insects, 3 to toxicity of arsenic to other animals, 8 to arsenical residues and 9+ to references. This volume will surely fulfill the author's aim to furnish a reference book on this subject.

—P. P. CALVERT.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

Wanted.—To hear from specialists who would care to determine some family of insects for a share of the duplicates. We have many specimens, especially in some families of Diptera and Hymenoptera. H. E. Jaques, Iowa Insect Survey, Mt. Pleasant, Iowa.

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